Section III:

AMENDMENT UNDER 37 CFR §1.121 to the DRAWINGS

It is proposed to modify Figures 3a and 3b by adding the notation "Prior Art" to them, as suggested in the Office Action.

Section IV:

AMENDMENT UNDER 37 CFR §1.121

REMARKS

Request for Telephone Interview

Applicant requests a telephone interview with the examiner and examiner's supervisor on February 17, 2005, at 2:30 p.m. (Eastern Time Zone) to discuss the present amendment, answer any questions the examiners may have, and to consider any suggestions the examiners may offer. Any suggestions which would place the claims in condition for allowance could then be adopted by the filing of a supplemental amendment by the applicant.

This application has received a provisional double patenting rejection over a related pending application, in which the same art has been cited. Applicant has requested in interview in this related application for 2:00 p.m., just prior to the interview for the present patent application, as the subject matter of the applications and the cited art are similar.

Please contact applicant's agent, Robert H. Frantz, at 405-812-5613 to confirm this appointment, or to indicate and alternate time and day which would be convenient for the examiners.

Objections to the Figures

In the Office Action, the examiner has objected to Figures 3a and 3b for illustrating prior art, but not containing a "Prior Art" notation. Figures 3a and 3b represent hypothetical data of a well known phenomena, and thus may or may not have existed exactly in the art as shown. However, applicant agrees to make such notation, as the"blurring" effect being discussed is prior art.

Reconsideration and withdrawal of the objection, and substitution of the figures is requetsed.

Rejections under 35 U.S.C. §101

In the Office Action, claims 1- 4, 9, 10, 14 - 17, and 21 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims in copending patent application 10/015,492.

We have amended our independent claims 1, 10, and 15, to include the steps, elements and limitations of Claims 5, 11 or 18, respectively, which define scope and patentable matter which is not in conflict with the claims of the copending patent application according to the examiner's analysis.

Reconsideration and withdrawal of the provisional rejections of claims - 4, 9, 10, 14 - 17, and 21 is requested.

Rejections under 35 U.S.C. §102(b)

In the Office Action, claims 1, 2, 4 - 6, 8 - 10, 14 - 16, 18, 21 have been rejected under 35 U.S.C. §102(b) for lack of novelty as being anticipated by U.S. Patent Number 4,574,311 to Resnikoff, *et al.* (hereinafter "Resnikoff").

Resnikoff differs from our invention in a number of ways:

(a) Resnikoff teaches use of a look up table to determine the position of each sensor (col. 9, line 24) because they employ a *probabilistic* distribution function such as a Poisson distribution function (col. 3, line 25). For complex probabilistic functions, or for large arrays of sensors, such a look up table would be extensive, and could consume a great deal of memory space. Additionally, to transfer a digitized image may require transferring the look up table with it (or having a corresponding look up table at the receiving end).

Our invention uses non-uniform distribution functions which are *predictable* such that no look up table is needed (emphasis added):

> [0024] Turning to Figure 5, the arrangement of sensors in a linear array according to the present invention is shown. The spacing between adjacent

> sensors in the x-axis are non-uniform, which avoids the physical creation of a frequency in the x-axis sampling operation. ... As such, the function used to **determine** the sensor-to-sensor spacing of the one-dimensional array can be generally expressed as an offset to a standard or uniform position:
>
> $$\text{Position of sensor } n = n \cdot P_{std} + F_x(n)$$
>
> where P_{std} is the standard or uniform spacing between sensors (e.g. maximum resolution), and $F_x(n)$ is a function which provides an position offset value in a non-uniform manner. For example, $F_x(n)$ may be a short, **predictable** pseudo-random number pattern, a nonlinear mathematical function which has broad spectral or harmonic content (e.g. ramp or sawtooth functions), or a **predictable** process such as a cyclic redundancy check ("CRC") polynomial.
>
> [0025] According to the preferred embodiment, a CRC process is used to generate the pseudo-random offset values, as **this avoids the need for large look up tables** and only needs three parameters to "seed" the determination of all the offset values. ...

Another way of expressing this difference is that our use of such predictable, non-linear processes provides a *deterministic* position for each pixel, wherein the normal definition of "deterministic" is employed (source http://www.dictionary.com, emphasis added):

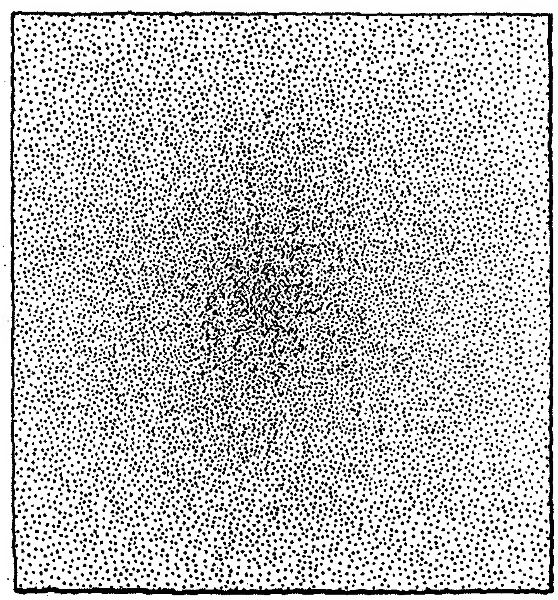
> **deterministic**
>
> 1. <probability> Describes a system whose time evolution can be **predicted** exactly. Contrast **probabilistic**.
>
> 2. <algorithm> Describes an algorithm in which the correct next step depends only on the current state. This contrasts with an algorithm involving backtracking where at each point

there may be several possible actions and no way to chose between them except by trying each one and backtracking if it fails.

Use of this term with this conventional definition is not new matter, as we described our preferred embodiment and the operation of a CRC function just in this manner, as we have stated in our disclosure at several points that our distribution function is "predictable", and as we have originally described "*determining* the position of a pixel". We have amended our independent claims to specify these types of position determination functions, which are not taught or suggested by Resnikoff.

(b) Resnikoff teaches an interpolation method which generates a "high resolution array" (col. 9, line 29 and at several other places), which is illustrated in Fig. 16 (e.g. "...densely packed near the center of the array", col 10, line 35). Note, however, that their method *adds* pixels to the already present, randomly spaced pixels, such that their added pixels are also randomly placed, as can be seen in Resnikoff's Fig. 16.

FIG. 16.



Resnikoff's Figure 16

They add pixels to correct for their undersampling of the image (col. 4, lines 45 - 47). Close consideration of their disclosed algorithm reveals that interpolation between three randomly placed pixels will yield an interpolated pixel which is also randomly positioned relative to the other pixels (except for the 3 used to make the interpolation, of course, to which its position will be related by the calculation of the center of mass or barycenter).

However, in our Claims 9, 14, and 21, we have claimed generating a "uniformly spaced data samples" array from our non-uniformly spaced data set which would be of the same density (e.g. same number of pixels) as the non-uniformly-space data set, which yields data similar to that of standard, grid-based sensors, which makes the output compatible with standard file types (emphasis added):

> ... Linear interpolation is applied to the non-uniformly spaced data set, synthesizing a uniformly-spaced data set for use in common imaging formats and processing. (Abstract)
>
> [0036] After the scan is complete (or concurrent with data sample collection), a **linear interpolation** may be performed between each non-uniformly spaced data sample to create **synthesized data values for a uniformly-spaced data set**. ...
> [0037] So, an array of evenly spaced data samples (68) for n = 1 to N columns and for m = 1 to M rows, is preferably generated from the dithered data set (64), **which can then be readily processed by common image compression and decompression technologies such as JPEG and MPEG utilities**.

We have amended Claims 9, 14, and 21 to more clearly specify this uniformly spaced output of our interpolation steps, which is not taught or suggested by Resnikoff.

For the foregoing reasons, Resnikoff fails to teach all of our claimed elements, steps, and limitations as required by MPEP 2131, and thus withdrawal of the rejections and allowance of claims 1, 2, 4 - 6, 8 - 10, 14 - 16, 18, 21 is requested.

Rejections under 35 U.S.C. §103

In the Office Action, claims 3, 7, 13, 17, AND 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Resnikoff in view of U.S. Patent 5,818,977 to Tansley (hereinafter "Tansley").

Tansley does not teach the elements as discussed in the foregoing paragraphs, nor does Tansley teach use of a nonlinear polynomial schema for *distribution* or *positioning* of sensors. Tansley teaches processing of an set of pixel data according to a polynomial equation (not necessarily a non-linear polynomial) applied to the *intensity* or *sensitivity* of each pixel. Each pixel in a fabricated array has a different gain, sensitivity, or "dynamic range" (e.g. the mathematical relationship between a range of light impending on the sensor and the voltage produced by the sensor). Tansley fits a polynomial equation to each data set according to the known sensitivities of the pixels in the arrays (e.g. they are initially calibrated by applying different images to them to determine their sensitivities). (Col. 2, lines 57 to col. 3, line 4). In fact, Tansley simply uses data from a "normal" CCD array, which implies the array has uniformly spaced sensor elements as no other definition is provided.

Therefore, Tansley's polynomial is applied to intensity levels for each pixel, not to the position or inter-pixel spacing of the pixels as we have claimed. For these reasons, reconsideration of the rejections of, and allowance of claims 3, 6, 14, and 16 is requested.

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